

Amendments to the Claim:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Withdrawn) A method for synthesising at least one molecule comprising the steps of
 - i) providing a plurality of connector polynucleotides each capable of hybridizing to at least 1 complementary connector polynucleotide,
 - ii) providing a plurality of complementary connector polynucleotides selected from the group consisting of
 - a) complementary connector polynucleotides comprising at least 1 reactant, such as a functional entity comprising at least 1 reactive group,
 - b) complementary connector polynucleotides comprising at least 1 reactive group,
 - c) complementary connector polynucleotides comprising at least 1 spacer region,
 - iii) hybridizing at least 2 complementary connector polynucleotides to at least 2 connector polynucleotides, wherein at least 2 of said complementary connector polynucleotides comprise at least 1 reactant, such as a functional entity comprising at least 1 reactive group, wherein at least 1 of said complementary connector polynucleotides hybridizes to at least 2 connector polynucleotides, and
 - iv) reacting at least 2 reactants or functional entity reactive groups by reacting at least 1 reactive group of each reactant or functional entity, wherein the reaction of said reactants or functional entity reactive groups results in the formation of the molecule by reacting the reactive groups of the

reactants provided by separate complementary connector polynucleotides, or by covalently linking at least 2 functional entities provided by separate complementary connector polynucleotides.

2. (Withdrawn) The method of claim 1, wherein step iv) comprises reacting at least 3 reactants or functional entity reactive groups, by reacting at least 1 reactive group of each reactant or functional entity.

3. (Withdrawn) The method of claim 1, wherein step iii) comprises

iii) hybridizing at least 3 complementary connector polynucleotides to at least 2 connector polynucleotides, wherein at least 3 of said complementary connector polynucleotides comprise at least 1 reactant, wherein at least 1 of said complementary connector polynucleotides hybridizes to at least 2 connector polynucleotides,

and wherein step iv) comprises

iv) reacting at least 3 reactants or functional entity reactive groups by reacting at least 1 reactive group of each reactant or functional entity,

wherein the reaction of said reactants or functional entity reactive groups results in the formation of the molecule by reacting the reactive groups of the reactants, or by covalently linking at least 3 functional entities provided by separate complementary connector polynucleotides.

4. (Withdrawn) The method of claim 3, wherein in step iv), at least 4 reactants or functional entity reactive groups are reacted, by reacting at least 1 reactive group of each reactant or functional entity.

5. (Withdrawn) The method of claim 1, wherein step iii) comprises

iii) hybridizing at least 4 complementary connector polynucleotides to at least 2 connector polynucleotides, wherein at least 4 of said complementary connector polynucleotides comprise at least 1 reactant, wherein at least 1 of said complementary connector polynucleotides hybridizes to at least 2 connector polynucleotides, and wherein step iv) comprises

iv) reacting at least 4 reactants or functional entity reactive groups by reacting at least 1 reactive group of each reactant or functional entity, wherein the reaction of said reactants or functional entity reactive groups results in the formation of the molecule by reacting the reactive groups of the reactants, or by covalently linking at least 4 functional entities provided by separate complementary connector polynucleotides.

6. (Withdrawn) The method of claim 5, wherein in step iv), at least 5 reactants or functional entity reactive groups are reacted, by reacting at least 1 reactive group of each reactant or functional entity.

7. (Withdrawn) The method of claim 1, wherein step iii) comprises

iii) hybridizing at least 5 complementary connector polynucleotides to at least 2 connector polynucleotides, wherein at least 5 of said complementary connector polynucleotides comprise at least 1 reactants, wherein at least 1 of said complementary connector polynucleotides hybridizes to at least 2 connector polynucleotides, and wherein step iv) comprises

iv) reacting at least 5 reactants or functional entity reactive groups by reacting at least 1 reactive group of each reactant or functional entity,

wherein the reaction of said reactants or functional entity reactive groups results in the formation of the molecule by reacting the reactive groups of the reactants, or by covalently linking at least 5 functional entities provided by separate complementary connector polynucleotides.

8. (Withdrawn) The method of claim 7, wherein in step iv), at least 6 reactants or functional entity reactive groups are reacted, by reacting at least 1 reactive group of each reactant or functional entity.

9. (Withdrawn) The method of claim 1, wherein the molecule comprising reacted reactants or covalently linked functional entities is linked to the polynucleotide part of a complementary connector polynucleotide.

10. (Withdrawn) The method of claim 1 comprising the further step of cleaving at least one linker linking the molecule comprising reacted reactants or covalently linked functional entities to the polynucleotide part of a complementary connector polynucleotide.

11. (Withdrawn) The method of claim 10, wherein all linkers but 1 linker are cleaved, and wherein the linker not cleaved links the molecule to the polynucleotide part of a complementary connector polynucleotide.

12. (Withdrawn) The method of claim 1, wherein complementary connector polynucleotides hybridized to connector polynucleotides are not linked by covalent bonds when reaction step iv) has been carried out, and/or wherein the polynucleotide part of different connector polynucleotides and/or different complementary connector polynucleotides are not covalently linked prior to the reactions of step iv).

13. (Withdrawn) The method of claim 12 comprising the further step of linking the complementary connector polynucleotides, optionally preceded by initially performing a polynucleotide extension reaction resulting in individual complementary connector polynucleotides being linked together by covalent bonds.

14. (Withdrawn - Currently Amended) The method of claim 1, wherein connector polynucleotides hybridized to complementary connector polynucleotides are not linked by covalent bonds when reaction step iv) has been carried out, and/or wherein the polynucleotide part of different connector polynucleotides and/or ~~different~~ different complementary connector polynucleotides are not covalently linked prior to the reactions of step iv).

15. (Withdrawn) The method of claim 14 comprising the further step of linking the connector polynucleotides, optionally preceded by performing a polynucleotide extension reaction resulting in individual connector polynucleotides being linked together by covalent bonds.

16. (Withdrawn) The method of claim 1 comprising the further steps of

- a) linking the complementary connector polynucleotides, optionally preceded by performing a polynucleotide extension reaction resulting in individual complementary connector polynucleotides being linked together by covalent bonds, and
- b) linking the connector polynucleotides, optionally preceded by performing a polynucleotide extension reaction resulting in individual connector polynucleotides being linked together by covalent bonds.

17. (Withdrawn) The method of claim 1, wherein the method does not involve ribosome mediated translation.

18. (Withdrawn) The method of claim 1 further comprising the step of hybridizing at least 1 further connector polynucleotide to at least 1 complementary connector polynucleotide, hybridized to at least 1 connector polynucleotide, of the hybridisation complex of step iii).

19. (Withdrawn) The method of claim 18, wherein the further connector polynucleotide is selected from the group consisting of

- a) connector polynucleotides comprising at least 1 functional entity comprising at least 1 reactive group,
- b) connector polynucleotides comprising at least 1 reactive group, and
- c) connector polynucleotides comprising at least 1 spacer region.

20. (Withdrawn) The method of claim 1 further comprising the step of hybridizing at least 1 further complementary connector polynucleotide selected from the group consisting of

- a) complementary connector polynucleotides comprising at least 1 functional entity comprising at least 1 reactive group,
- b) complementary connector polynucleotides comprising at least 1 reactive group, and
- c) complementary connector polynucleotides comprising at least 1 spacer region,

to the hybridisation complex of step iii), or to at least 1 further connector polynucleotide of said hybridisation complex.

21. (Withdrawn) The method of claim 18, wherein the step of hybridizing at least 1 further connector polynucleotide is repeated at least once.

22. (Withdrawn) The method of claim 20, wherein the step of hybridising at least one further complementary connector polynucleotide is repeated at least once.

23. (Withdrawn - Currently Amended) The method of claim 1, wherein at least n connector polynucleotides and at least n-1 complementary connector polynucleotides are provided, n being an integer of from 3 to 6, and wherein each complementary connector-~~polynucleotide~~ polynucleotide hybridizes to at least 2 connector polynucleotides.

24. (Withdrawn) The method of claim 23, wherein n is 3 or 4.

25. (Withdrawn - Currently Amended) The method of claim 1, wherein at least n connector polynucleotides and at least n complementary connector polynucleotides are provided, n being an integer of from 3 to 6, and wherein at least n-1 complementary connector-~~polynucleotide~~ polynucleotide hybridize to at least 2 connector polynucleotides.

26. (Withdrawn - Currently Amended) The method of claim 25, wherein n complementary connector-~~polynucleotides~~ polynucleotides hybridize to at least 2 connector polynucleotides.

27. (Withdrawn) The method of claim 25, wherein n is 3 or 4.

28. (Withdrawn - Currently Amended) The method of claim 1, wherein at least n connector polynucleotides and at least n+1 complementary connector polynucleotides are provided, n being an integer of from 3 to 6, and wherein at least n-1 complementary connector-~~polynucleotide~~ polynucleotide hybridize to at least 2 connector polynucleotides.

29. (Withdrawn - Currently Amended) The method of claim 28, wherein n complementary connector-~~polynucleotide~~ polynucleotide hybridize to at least 2 connector polynucleotides.

30. (Withdrawn) The method of claim 28, wherein n is 3 or 4.

31. (Withdrawn - Currently Amended) The method of claim 1, wherein at least n connector polynucleotides and at least n+2 complementary connector polynucleotides are provided, n being an integer of from 3 to 6, and wherein at least n-1 complementary connector ~~polynucleotide~~ polynucleotide hybridize to at least 2 connector polynucleotides.

32. (Withdrawn - Currently Amended) The method of claim 31, wherein n complementary connector ~~polynucleotide~~ polynucleotide hybridize to at least 2 connector polynucleotides.

33. (Withdrawn) The method of claim 31, wherein n is 3 or 4.

34. (Withdrawn - Currently Amended) The method of claim 1, wherein at least n connector polynucleotides and at least n+3 complementary connector polynucleotides are provided, n being an integer of from 3 to 6, and wherein at least n-1 complementary connector ~~polynucleotide~~ polynucleotide hybridize to at least 2 connector polynucleotides.

35. (Withdrawn - Currently Amended) The method of claim 34, wherein n complementary connector ~~polynucleotide~~ polynucleotide hybridize to at least 2 connector polynucleotides.

36. (Withdrawn) The method of claim 34, wherein n is 3 or 4.

37. (Withdrawn - Currently Amended) The method of claim 1, wherein at least n connector polynucleotides and at least n+4 complementary connector polynucleotides are provided, n being an integer of from 3 to 6, and wherein at least n-1 complementary connector ~~polynucleotide~~ polynucleotide hybridize to at least 2 connector polynucleotides.

38. (Withdrawn - Currently Amended) The method of claim 37, wherein n complementary connector ~~polynucleotide~~

polynucleotide hybridize to at least 2 connector polynucleotides.

39. (Withdrawn) The method of claim 37, wherein n is 3 or 4.

40. (Withdrawn - Currently Amended) The method of claim 1, wherein said plurality of connector polynucleotides comprises branched connector polynucleotides, wherein at least n branched connector polynucleotides and at least n complementary connector polynucleotides are provided, n being an integer of from 2 to 6, and wherein at least n-1 complementary connector ~~polynucleotide~~ polynucleotide hybridize to at least 2 branched connector polynucleotides.

41. (Withdrawn) The method of claim 40, wherein at least n+1 complementary connector polynucleotides are provided.

42. (Withdrawn) The method of claim 40, wherein at least n complementary connector polynucleotides hybridize to at least 2 branched connector polynucleotides.

43. (Withdrawn - Currently Amended) The method of claim 42, wherein at least n+1 complementary connector ~~polynucleotide~~ polynucleotide hybridize to at least 2 connector polynucleotides.

44. (Withdrawn) The method of claim 40, wherein n is 3 or 4.

45. (Withdrawn) The method of claim 1 comprising the further step of repeating, for different connector polynucleotides and different complementary connector polynucleotides, the steps iii) and iv) at least once, wherein the different complementary connector polynucleotides are hybridised, in each repeated step iii), to the hybridisation complex having been generated in the previous steps of the method, and wherein different functional entities are linked in each repeated step iv).

46. (Withdrawn - Currently Amended) The method of claim 1, wherein a plurality of reactive groups of at least 1

~~functional~~ functional entity of a complementary connector polynucleotide react with reactive groups of functional entities of at least 2 other complementary connector polynucleotides.

47. (Withdrawn) The method of claim 46, wherein the at least 1 functional entity comprises from 2 to 6 reactive groups.

48. (Withdrawn) The method of claim 47, wherein at least 3 of said reactive groups of said at least 1 functional entity react with at least 1 reactive group of at least 3 additional functional entities.

49. (Withdrawn) The method of claim 1, wherein said plurality of complementary connector polynucleotides comprise at least 2 complementary connector polynucleotides which are non-identical.

50. (Withdrawn) The method of claim 1, wherein said plurality of complementary connector polynucleotides comprise at least 2 branched complementary connector polynucleotides.

51. (Withdrawn) The method of claim 1, wherein said plurality of connector polynucleotides comprise connector polynucleotides comprising a sequence of n nucleotides, wherein n is an integer of from 8 to less than 100.

52. (Withdrawn) The method of claim 51, wherein said plurality of connector polynucleotides further comprise connector polynucleotides comprising at least 1 branching point connecting at least three polynucleotide fragments comprising a sequence of n nucleotides, wherein n is an integer of from 8 to less than 100.

53. (Withdrawn) The method of claim 1, wherein said plurality of complementary connector polynucleotides comprise polynucleotides comprising a sequence of n nucleotides, wherein n is an integer of from 8 to less than 60.

54. (Withdrawn) The method of claim 53, wherein said plurality of complementary connector polynucleotides further

comprise polynucleotides comprising at least 1 branching point connecting at least three polynucleotide fragments comprising a sequence of n nucleotides, wherein n is an integer of from 8 to less than 60.

55. (Withdrawn) The method of claim 1, wherein the polynucleotide part of at least one connector polynucleotide and/or at least one complementary connector polynucleotide is capable of undergoing self-hybridization.

56. (Withdrawn) The method of claim 1 comprising the further step of covalently linking at least one connector polynucleotide to at least one complementary connector polynucleotide.

57. (Withdrawn) The method of claim 1, wherein the connector polynucleotides and/or the complementary connector polynucleotides are provided in batch.

58. (Withdrawn) The method of claim 1, wherein the connector polynucleotides and/or the complementary connector polynucleotides are provided sequentially, and wherein at least some functional entities provided with the connector polynucleotides and/or with the complementary connector polynucleotides are reacted before additional connector polynucleotides and/or the complementary connector polynucleotides are provided.

59. (Withdrawn) The method of claim 58, wherein reactive groups of functional entities are reacted when a) at least two connector polynucleotides comprising at least two functional entities have been provided, and/or b) at least two complementary connector polynucleotides comprising at least two functional entities have been provided, and/or c) when at least one connector polynucleotide comprising at least one functional entity and at least one complementary connector polynucleotide comprising at least one functional entity have been provided.

60. (Withdrawn) A method for synthesising a plurality of different molecules, said method comprising

- i) providing a plurality of connector polynucleotides each capable of hybridizing to at least 1 complementary connector polynucleotide,
- ii) providing a plurality of complementary connector polynucleotides selected from the group consisting of
 - a) complementary connector polynucleotides comprising at least 1 functional entity comprising at least 1 reactive group,
 - b) complementary connector polynucleotides comprising at least 1 reactive group,
 - c) complementary connector polynucleotides comprising at least 1 spacer region,
- iii) hybridizing the plurality of connector polynucleotides and complementary connector polynucleotides, thereby forming a plurality of different hybridisation complexes, each hybridisation complex comprising at least 2 complementary connector polynucleotides and at least 2 connector polynucleotides, wherein, for each of said hybridisation complexes, at least 2 of said complementary connector polynucleotides comprise at least 1 functional entity comprising at least 1 reactive group, and at least 1 of said complementary connector polynucleotides hybridizes to at least 2 connector polynucleotides, and
- iv) reacting at least 2 functional entity reactive groups of each complex by reacting at least 1 reactive group of each functional entity,

wherein, for each hybridisation complex, the reaction of said functional entity reactive groups results in the formation of a different molecule by covalently linking at

least 2 functional entities provided by separate complementary connector polynucleotides, thereby synthesising a plurality of different molecules.

61. (Withdrawn) The method of claim 60, wherein different molecules are synthesised.

62. (Withdrawn) The method of claim 60 comprising the further step of selecting molecules having desirable characteristics, wherein the selection employs a predetermined assaying procedure.

63. (Withdrawn) The method of claim 60 comprising the further step of amplifying at least part of the individual connector polynucleotides used for the synthesis of a selected molecule, wherein optionally at least one PCR primer comprises a functional entity and further optionally also part of the polynucleotide part of a connector polynucleotide.

64. (Withdrawn) The method of claim 63 comprising the further step of contacting a population of said amplified connector polynucleotides, or fragments thereof, with a plurality of complementary connector polynucleotides.

65. (Withdrawn) The method of claim 64 comprising the further step of performing an additional synthesis round using a population of said amplified connector polynucleotides or a population of said amplified connector polynucleotide fragments.

66. (Withdrawn) The method of claim 60 comprising the further steps of ligating, optionally preceded by a polynucleotide extension reaction, individual connector polynucleotides, and ligating, optionally preceded by performing a polynucleotide extension reaction, individual complementary connector polynucleotides, wherein said ligation results in linking individual connector polynucleotides and/or individual complementary connector polynucleotides by covalent bonds.

67. (Withdrawn) The method of claim 66 comprising the further steps of

- a) digesting said ligated connector polynucleotides and complementary connector polynucleotides,
- b) displacing the duplex polynucleotide strands generated by the ligation reaction, thereby generating single polynucleotide strands of ligated connector polynucleotides and ligated complementary connector polynucleotides, and
- c) contacting the single stranded polynucleotides generated in step b) with a plurality of complementary connector polynucleotides at least some of which comprises at least one functional entity comprising a reactive group.

68. (Withdrawn) The method of claim 67 comprising the further step of performing an additional synthesis round, using as starting materials the population of connector polynucleotides obtained in step b) of claim 67, and the plurality of complementary connector polynucleotides provided in step c) of claim 67.

69. (Withdrawn) The method of claim 60, wherein the plurality of complementary connector polynucleotides comprises from about 20 to about 10^6 different complementary polynucleotides,.

70. (Withdrawn) The method of claim 60 comprising the further steps of linking individual connector polynucleotides by ligation and/or linking individual complementary connector polynucleotides by ligation, synthesising a plurality of different molecules by reacting for each hybridization complex reactive groups of different functional entities, wherein each of said molecules are linked to a polynucleotide of the hybridization complex, selecting and/or isolating desirable molecules linked to a polynucleotide of the hybridization

complex by a predetermined selection procedure, including a binding assay, isolating from selected and/or isolated hybridization complexes polynucleotides comprising individual connector polynucleotides linked by ligation, optionally amplifying said polynucleotides, digesting said polynucleotides comprising individual connector polynucleotides and obtaining a plurality of connector polynucleotides, and contacting the plurality of connector polynucleotides generated in step e) with a plurality of complementary connector polynucleotides at least some of which comprises at least one functional entity comprising a reactive group, and performing a second or further round molecule synthesis using said plurality of connector polynucleotides and said plurality of complementary connector polynucleotides.

71. (Withdrawn - Currently Amended) The method of claim 60 comprising the further steps of linking individual connector polynucleotides by ligation and/or linking individual complementary connector polynucleotides by ligation, synthesising a plurality of different molecules by reacting for each hybridization complex reactive groups of different functional entities, wherein each of said molecules are linked to a polynucleotide of the hybridization complex, selecting and/or isolating desirable molecules linked to a polynucleotide of the hybridization complex by a predetermined selection procedure, including a binding assay, isolating from selected and/or isolated hybridization complexes polynucleotides comprising individual connector polynucleotides linked by ligation, optionally amplifying said polynucleotides, contacting the plurality of polynucleotides comprising connector polynucleotides linked by ligation generated in step d) with a plurality of complementary connector polynucleotides each comprising at least one functional entity comprising a reactive group, performing a second or further round molecule synthesis using said

plurality of connector polynucleotides and said plurality of complementary connector polynucleotides, and optionally ~~repeating~~ repeating steps c) to f).

72. (Withdrawn) The method of claim 70, wherein steps a) and b) are performed sequentially in any order.

73. (Withdrawn) The method of claim 70, wherein steps a) and b) are performed simultaneously.

74. (Withdrawn) The method of claim 70, wherein steps a) and c) are performed sequentially in any order.

75. (Withdrawn) The method of claim 70, wherein steps a) and c) are performed simultaneously.

76. (Withdrawn) The method of claim 60, wherein the plurality of synthesised molecules are selected from the group consisting of a -peptides, b -peptides, g -peptides, w-peptides, mono-, di- and tri-substituted a -peptides, b -peptides, g -peptides, w -peptides, peptides wherein the amino acid residues are in the L-form or in the D-form, vinylogous polypeptides, glycopoly-peptides, polyamides, vinylogous sulfonamide peptides, polysulfonamides, conjugated peptides comprising e.g. prosthetic groups, polyesters, polysaccharides, polycarbamates, polycarbonates, polyureas, polypeptidylphosphonates, polyurethanes, azatides, oligo N-substituted glycines, polyethers, ethoxyformacetal oligomers, poly-thioethers, polyethylene glycols (PEG), polyethylenes, polydisulfides, polyarylene sulfides, polynucleotides, PNAs, LNAs, morpholinos, oligo pyrrolinones, polyoximes, polyimines, polyethyleneimines, polyimides, polyacetals, polyacetates, polystyrenes, polyvinyl, lipids, phospholipids, glycolipids, polycyclic compounds comprising e.g. aliphatic or aromatic cycles, including polyheterocyclic compounds, proteoglycans, and polysiloxanes, including any combination thereof,

wherein each molecule is synthesised by reacting a plurality of functional entities preferably in the range of from 2 to 200,

wherein the functional entities of the above molecules can be linked by a chemical bond selected from the group of chemical bonds consisting of peptide bonds, sulfonamide bonds, ester bonds, saccharide bonds, carbamate bonds, carbonate bonds, urea bonds, phosphonate bonds, urethane bonds, azatide bonds, peptoid bonds, ether bonds, ethoxy bonds, thioether bonds, single carbon bonds, double carbon bonds, triple carbon bonds, disulfide bonds, sulfide bonds, phosphodiester bonds, oxime bonds, imine bonds, imide bonds, including any combination thereof,

or wherein the backbone structure of a synthesised molecule preferably comprises or essentially consists of one or more molecular group(s) selected from -NHN(R)CO- ; -NHB(R)CO- ; -NHC(RR')CO- ; -NHC(=CHR)CO- ; -NHC₆H₄CO- ; -NHCH₂CHRCO- ; -NHCHRCH₂CO- ; -COCH₂- ; -COS- ; -CONR- ; -COO- ; -CSNH- ; -CH₂NH- ; -CH₂CH₂- ; -CH₂S- ; -CH₂SO- ; -CH₂SO₂- ; -CH(CH₃)S- ; -CH=CH- ; -NHCO- ; -NHCONH- ; -CONHO- ; -C(=CH₂)CH₂- ; -PO₂⁻NH- ; -PO₂⁻CH₂- ; -PO₂⁻CH₂N⁺- ; -SO₂NH⁻ ; and lactams, including any combination thereof.

77. (Withdrawn) The method of claim 60, wherein said method results in the synthesis of more than or about 10³ different molecules.

78. (Withdrawn) A method for identification of at least one molecule having desirable characteristics, said method comprising the steps of

- i) targeting a plurality of different molecules to a potential binding partner, wherein the plurality of different molecules are a) synthesised by the method of claim 60, or b) synthesised by the below mentioned method steps iii) and iv),

- ii) selecting at least one of said molecules having an affinity for said binding partner,
- iii) isolating connector polynucleotides from the selected molecules of step ii),
- iv) optionally, hybridizing the connector polynucleotides isolated in step iii) to a plurality of complementary connector polynucleotides selected from the group consisting of
 - a) complementary connector polynucleotides comprising at least 1 functional entity comprising at least 1 reactive group,
 - b) complementary connector polynucleotides comprising at least 1 reactive group,
 - c) complementary connector polynucleotides comprising at least 1 spacer region,
 reacting the functional entity reactive groups, thereby generating at least one molecule by linking at least 2 functional entities provided by separate complementary connector polynucleotides, and performing steps i), ii), and iii) above for the at least one molecule generated in step iv), and
- v) decoding the nucleic acid sequence of isolated connector polynucleotides to reveal the identity of functional entities that have participated in the formation of the molecule(s) having an affinity for said binding partner.

79. (Previously Presented) A bifunctional molecule obtainable by the method of claim 1, said bifunctional molecule comprising a molecule part formed by reaction of functional entities, and a nucleic acid part formed by hybridisation between at least 2 complementary connector polynucleotide and at least 2 connector polynucleotides, wherein at least 2 of said polynucleotides comprise at least

one functional entity comprising at least one reactive group the reaction of which results in the formation of the molecule part.

80. (Currently Amended) The bifunctional molecule ~~aeording~~ according to claim 79 comprising at least n connector polynucleotides and at least n-1 complementary connector polynucleotides, n being an integer of from 3 to 6, wherein each complementary connector ~~polynueletide~~ polynucleotide hybridizes to at least 2 connector polynucleotides.

81. (Currently Amended) The bifunctional molecule ~~aeording~~ according to claim ~~79~~ 80, wherein n is 3 or 4.

82. (Currently Amended) The bifunctional molecule according to claim 79 comprising at least n connector polynucleotides and at least n complementary connector polynucleotides, n being an integer of from 3 to 6, and wherein at least n-1 complementary connector ~~polynueletide~~ polynucleotide hybridize to at least 2 connector polynucleotides.

83. (Currently Amended) The bifunctional molecule according to claim 82, wherein n complementary connector ~~polynueletides~~ polynucleotides hybridize to at least 2 connector polynucleotides.

84. (Previously Presented) The bifunctional molecule according to claim 82, wherein n is 3 or 4.

85. (Currently Amended) The bifunctional molecule according to claim 79 comprising at least n connector polynucleotides and at least n+1 complementary connector polynucleotides, n being an integer of from 3 to 6, and wherein at least n-1 complementary connector ~~polynueletide~~ polynucleotide hybridize to at least 2 connector polynucleotides.

86. (Currently Amended) The bifunctional molecule according to claim ~~75~~ 85, wherein n complementary connector

~~polynucleotide~~ polynucleotide hybridize to at least 2 connector polynucleotides.

87. (Previously Presented) The bifunctional molecule according to claim 75, wherein n is 3 or 4.

88. (Currently Amended) The bifunctional molecule according to claim ~~79~~ 85 comprising at least n connector polynucleotides and at least n+2 complementary connector polynucleotides, n being an integer of from 3 to 6, and wherein at least n-1 complementary connector-~~polynucleotide~~ polynucleotide hybridize to at least 2 connector polynucleotides.

89. (Currently Amended) The bifunctional molecule according to claim 88, wherein n complementary connector ~~polynucleotide~~ polynucleotide hybridize to at least 2 connector polynucleotides.

90. (Previously Presented) The bifunctional molecule according to claim 88, wherein n is 3 or 4.

91. (Currently Amended) The bifunctional molecule according to claim 79 comprising at least n connector polynucleotides and at least n+3 complementary connector polynucleotides, n being an integer of from 3 to 6, and wherein at least n-1 complementary connector-~~polynucleotide~~ polynucleotide hybridize to at least 2 connector polynucleotides.

92. (Currently Amended) The bifunctional molecule according to claim 91, wherein n complementary connector ~~polynucleotide~~ polynucleotide hybridize to at least 2 connector polynucleotides.

93. (Previously Presented) The bifunctional molecule according to claim 91, wherein n is 3 or 4.

94. (Currently Amended) The bifunctional molecule according to claim 79 comprising at least n connector polynucleotides and at least n+4 complementary connector polynucleotides, n being an integer of from 3 to 6, and

wherein at least n-1 complementary connector-~~polynucleotide~~
polynucleotide hybridize to at least 2 connector
polynucleotides.

95. (Currently Amended) The bifunctional molecule
according to claim ~~79~~ 84, wherein n complementary connector
~~polynucleotide~~ polynucleotide hybridize to at least 2 connector
polynucleotides.

96. (Previously Presented) The bifunctional molecule
according to claim 94, wherein n is 3 or 4.

97. (Currently Amended) The bifunctional molecule
according to claim 79, wherein said plurality of connenctor
polynucleotides comprises branched connector polynucleotides,
wherein at least n branched connector polynucleotides and at
least n complementary connector polynucleotides are provided,
n being an integer of from 2 to 6, and wherein at least n-1
complementary connector-~~polynucleotide~~ polynucleotide hybridize
to at least 2 branched connector polynucleotides.

98. (Original) The bifunctional molecule according to
claim 97 comprising at least n+1 complementary connector
polynucleotides.

99. (Previously Presented) The bifunctional molecule
according to claim 97, wherein at least n complementary
connector polynucleotides hybridize to at least 2 branched
connector polynucleotides.

100. (Currently Amended) The bifunctional molecule
according to claim 99, wherein at least n+1 complementary
connector-~~polynucleotide~~ polynucleotide hybridize to at least 2
connector polynucleotides.

101. (Previously Presented) The bifunctional molecule
according to claim 97, wherein n is 3 or 4.

102. (Previously Presented) A composition or plurality of
bifunctional molecules according to claim 79.

103. (Currently Amended) The composition or plurality according to claim 102 comprising at least about 10^3 different bifunctional molecules[[,]].

104. (Previously Presented) The bifunctional molecule according to claim 79,

wherein the said bifunctional molecules comprise molecules selected from the group consisting of a -peptides, b -peptides, g -peptides, w-peptides, mono-, di- and tri-substituted a -peptides, b -peptides, g -peptides, w-peptides, peptides wherein the amino acid residues are in the L-form or in the D-form, vinylogous polypeptides, glycopoly-peptides, polyamides, vinylogous sulfonamide peptides, polysulfonamides, conjugated peptides comprising e.g. prosthetic groups, polyesters, polysaccharides, polycarbamates, polycarbonates, polyureas, polypeptidylphosphonates, polyurethanes, azatides, oligo N-substituted glycines, polyethers, ethoxyformacetal oligomers, poly-thioethers, polyethylene glycols (PEG), polyethylenes, polydisulfides, polyarylene sulfides, polynucleotides, PNAs, LNAs, morpholinos, oligo pyrrolinones, polyoximes, polyimines, polyethyleneimines, polyimides, polyacetals, polyacetates, polystyrenes, polyvinyl, lipids, phospholipids, glycolipids, polycyclic compounds comprising e.g. aliphatic or aromatic cycles, including polyheterocyclic compounds, proteoglycans, and polysiloxanes, including any combination thereof,

wherein preferably the functional entities of the above molecules can be linked by a chemical bond selected from the group of chemical bonds consisting of peptide bonds, sulfonamide bonds, ester bonds, saccharide bonds, carbamate bonds, carbonate bonds, urea bonds, phosphonate bonds, urethane bonds, azatide bonds, peptoid bonds, ether bonds, ethoxy bonds, thioether bonds, single carbon bonds, double

carbon bonds, triple carbon bonds, disulfide bonds, sulfide bonds, phosphodiester bonds, oxime bonds, imine bonds, imide bonds, including any combination thereof, or wherein preferably the backbone structure of a synthesised molecule preferably comprises or essentially consists of one or more molecular group(s) selected from -NHN(R)CO- ; -NHB(R)CO- ; -NHC(RR')CO- ; -NHC(=CHR)CO- ; -NHC₆H₄CO- ; -NHCH₂CHRCO- ; -NHCHRCH₂CO- ; -COCH₂- ; -COS- ; -CONR- ; -COO- ; -CSNH- ; -CH₂NH- ; -CH₂CH₂- ; -CH₂S- ; -CH₂SO- ; -CH₂SO₂- ; -CH(CH₃)S- ; -CH=CH- ; -NHCO- ; -NHCONH- ; -CONHO- ; -C(=CH₂)CH₂- ; -PO₂⁻NH- ; -PO₂⁻CH₂- ; -PO₂⁻CH₂N⁺- ; -SO₂NH⁻ ; and lactams, including any combination thereof.

105. (Withdrawn) A method for selecting at least one bifunctional molecule from the composition of bifunctional molecules according to claim 102, said method comprising the steps of

- a) targeting a plurality of bifunctional molecules to a potential binding partner, and
- b) selecting or identifying at least one of said bifunctional molecules having an affinity for said binding partner.

106. (Withdrawn) The method of claim 105, wherein the identification of the bifunctional molecule comprises the steps of decoding the nucleic acid sequence of isolated connector polynucleotides to reveal the identity of functional entities that have participated in the formation of the molecule(s) having an affinity for said binding partner.

107. (Withdrawn) A method for evolving a plurality of bifunctional molecules according to claim 79, said method comprising the steps of

- a) selecting at least one bifunctional molecule,

- b) isolating connector polynucleotides, or fragments of such polynucleotides, from said bifunctional molecule,
- c) providing a plurality of complementary connector polynucleotides,
- d) hybridising said isolated connector polynucleotides and said plurality of complementary connector polynucleotides,
- e) reacting functional entity reactive groups of said complementary connector polynucleotides,
- f) optionally repeating any combination of the aforementioned steps, and
- g) evolving a plurality of bifunctional molecules each comprising a different molecule comprising covalently linked functional entities.

108. (Withdrawn) A method for synthesising at least one molecule, said method comprising the steps of

- i) providing a plurality of building block polynucleotides each capable of hybridizing to at least 1 other building block polynucleotide,

wherein said building block polynucleotides are selected from the group consisting of

- a) building block polynucleotides comprising at least 1 reactant comprising at least 1 reactive group
 - b) building block polynucleotides comprising at least 1 reactive group,
 - c) building block polynucleotides comprising at least 1 spacer region,
- ii) forming a hybridization complex comprising at least 4 building block polynucleotides,

wherein at least 2 of said building block polynucleotides comprise at least 1 reactant comprising at least 1 reactive group,

wherein at least 1 of said building block polynucleotide hybridizes to at least 2 other building block polynucleotides, and

iii) synthesising the at least one molecule by reacting at least 2 reactants.

109. (Withdrawn) The method of claim 108, comprising the steps of

- i) providing m building block polynucleotides selected from the group consisting of
 - a) building block polynucleotides comprising at least 1 functional entity comprising at least 1 reactive group,
 - b) building block polynucleotides comprising at least 1 reactive group,
 - c) building block polynucleotides comprising at least 1 spacer region and no functional entity or reactive group,

wherein m is an integer of at least 4 and less than

200,

- ii) hybridizing the m building block polynucleotides to form a hybridization complex,
wherein at least 2 of said building block polynucleotides comprise at least 1 functional entity comprising at least 1 reactive group,
wherein at least 1 of said building block polynucleotides hybridizes to at least 2 other building block polynucleotides,
with the proviso that no single building block polynucleotide hybridizes to the remaining m-1 building block polynucleotides,
- iii) reacting at least 3 functional entity reactive groups by reacting at least 1 reactive group of each functional entity,

wherein the reaction of said functional entity reactive groups results in the formation of the molecule by covalently linking at least 2 functional entities provided by separate building block polynucleotides.

110. (Withdrawn) The method of claim 109, wherein m is 4, and wherein the complex comprises

- i) p building block polynucleotides comprising at least 1 functional entity comprising at least 1 reactive group,
- ii) q building block polynucleotides comprising at least 1 reactive group, and
- iii) r building block polynucleotides comprising at least 1 spacer region and no functional entity or reactive group,

wherein $p + q + r$ is 4,

wherein p is an integer of from 2 to 4,

wherein q is an integer of from 0 to 2,

wherein the sum of p and q is 4 or less, and

wherein the value of r is given by $r = 4 - (p + q)$.

111. (Withdrawn) The method of claim 107, wherein m is 6, and wherein the complex comprises

- i) p building block polynucleotides comprising at least 1 functional entity comprising at least 1 reactive group,
- ii) q building block polynucleotides comprising at least 1 reactive group, and
- iii) r building block polynucleotides comprising at least 1 spacer region and no functional entity or reactive group,

wherein $p + q + r$ is 6,

wherein p is an integer of from 2 to 6,

wherein q is an integer of from 0 to 4, preferably an integer of from 0 to 2,

wherein the sum of p and q is 6 or less, and

wherein the value of r is given by $r = 6 - (p + q)$.

112. (Withdrawn) The method of claim 107, wherein m is 8, and wherein the complex comprises

- i) p building block polynucleotides comprising at least 1 functional entity comprising at least 1 reactive group,
- ii) q building block polynucleotides comprising at least 1 reactive group, and
- iii) r building block polynucleotides comprising at least 1 spacer region and no functional entity or reactive group,

wherein $p + q + r$ is 8,

wherein p is an integer of from 3 to 8,

wherein q is an integer of from 0 to 5, preferably an integer of from 0 to 3,

wherein the sum of p and q is 8 or less, and

wherein the value of r is given by $r = 8 - (p + q)$.

113. (Withdrawn) The method of claim 109, wherein at least 3 of said building block polynucleotides comprise at least 1 functional entity comprising at least 1 reactive group,

wherein the number of building block polynucleotides hybridizing to at least 2 other building block polynucleotides is in the range of from 1 to m .

with the proviso that no single building block polynucleotide hybridises to the remaining $m-1$ building block polynucleotides.

114. (Withdrawn) The method of claim 109, wherein the sum of q and r is at least 1.

115. (Withdrawn) A method for synthesising a plurality of different molecules, said method comprising the steps of

- i) providing a plurality of at least 1000 different building block polynucleotides each comprising at least one reactant,

- ii) selecting or providing from said plurality of building block polynucleotides n different building block polynucleotides for the synthesis of each different molecule, wherein n is an integer of at least 3 and less than 200,
- iii) optionally further providing to the reaction compartment a plurality of building block polynucleotides selected from the group consisting of building block polynucleotides comprising at least 1 reactive group (type II) and building block polynucleotides comprising at least 1 spacer region and no functional entity or reactive group (type III),
- iv) hybridizing at least the selected or provided n building block polynucleotides to form a hybridization complex,
 - wherein at least n of said building block polynucleotides comprise at least 1 reactant comprising at least 1 reactive group,
 - wherein at least 1 of said building block polynucleotides hybridizes to at least 2 other building block polynucleotides,
 - with the proviso that no single building block polynucleotide hybridizes to the remaining $n-1$ building block polynucleotides, and
- v) reacting the at least n reactants by reacting at least 1 reactive group of each reactant, wherein the reaction of said reactants provided by separate building block polynucleotides results in the formation of at least one molecule, wherein the at least one molecule is linked to at least one building block polynucleotide by at least one linker, and repeating the steps ii) to v) for different selections or provisions of building block polynucleotides each comprising at least one reactant, thereby generating a plurality of different molecules.

116. (Withdrawn) The method of claim 115 comprising the further steps of targeting the plurality of bifunctional molecules obtained from the method of claim 115 to at least

one binding partner for at least one of said molecule parts of said bifunctional molecules, selecting at least one bifunctional molecule having an increased affinity for said binding partner, and identifying the molecule part of the bifunctional molecule by decoding the polynucleotide part of the plurality of building block polynucleotides forming the hybridisation complex of said bifunctional molecule.

117. (Withdrawn) The method of claim 116 comprising the further step of improving the binding of said molecule part to said binding partner, said improvement comprising the steps of isolating building block polynucleotides from the isolated bifunctional molecule, optionally separating building block polynucleotides into fractions depending on whether or not they have donated a reactant to the synthesis of the at least one molecule, hybridising some or all of said isolated building block polynucleotides with a plurality of building block polynucleotides each comprising at least one reactant, forming a plurality of second or further bifunctional molecules by reacting said reactants and linking said molecules to at least one building block polynucleotide of their respective hybridisation complexes, targeting said plurality of second or further bifunctional molecules to at least one target comprising a conceivable binding partner for the molecule parts of said plurality of bifunctional molecules, and selecting bifunctional molecules having improved binding affinities for said at least one target.

118. (New) A bifunctional molecule comprising a molecule formed by reaction of functional entities and a nucleic acid part comprising at least 4 building block polynucleotides, wherein the building block polynucleotides are not linked by covalent bonds when the functional entities have reacted and formed the molecule of the bifunctional molecule, and wherein the functional entities, when reacted, are not all linked by, or do not all form, phosphodiester bonds.

119. (New) A bifunctional molecule comprising a molecule formed by reaction of functional entities and a nucleic acid part comprising at least 2 complementary connector polynucleotides hybridized to at least 2 connector polynucleotides, wherein said connector polynucleotides are not linked by covalent bonds when the functional entities have reacted and formed the molecule of the bifunctional molecule, and wherein the functional entities, when reacted, are not all linked by, or do not all form, phosphodiester bonds.

120. (New) A bifunctional molecule comprising a molecule formed by reaction of functional entities and a nucleic acid part comprising at least 2 complementary connector polynucleotides hybridized to at least 2 connector polynucleotides, wherein said complementary connector polynucleotides are not linked by covalent bonds when the functional entities have reacted and formed the molecule of the bifunctional molecule, and wherein the functional entities, when reacted, are not all linked by, or do not all form, phosphodiester bonds.

121. (New) A bifunctional molecule comprising a molecule formed by reaction of functional entities and a nucleic acid part comprising at least 2 complementary connector polynucleotides hybridized to at least 2 connector polynucleotides, wherein said connector polynucleotides and said complementary connector polynucleotides are not linked by covalent bonds when the functional entities have reacted and formed the molecule of the bifunctional molecule, and wherein the functional entities, when reacted, are not all linked by, or do not all form, phosphodiester bonds.

122. (New) The bifunctional molecule according to claim 79, wherein the molecule part of the molecule comprises a cyclic sequence of functional entities.

123. (New) The bifunctional molecule according to claim 118, wherein the molecule part of the molecule comprises a cyclic sequence of functional entities.

124. (New) The bifunctional molecule according to claim 79, wherein the functional entities comprises amino acid residues.

125. (New) The bifunctional molecule according to claim 118, wherein the functional entities comprises amino acid residues.

126. (New) The bifunctional molecule according to claim 79, wherein the molecule part of the molecule comprises a small molecule having a molecular weight of less than 1000 Daltons.

127. (New) The bifunctional molecule according to claim 118, wherein the molecule part of the molecule comprises a small molecule having a molecular weight of less than 1000 Daltons.